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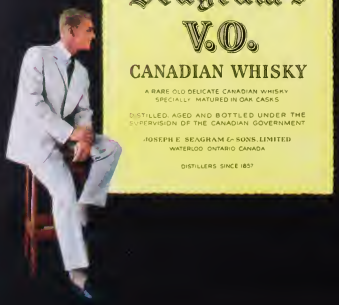
the New Technology and the Arts

A view of the interior of Les Levine's Slipcover at the Art Gallery of Ontario. 1966 (photo: Ron Vickers)

pop art

op art



top art

In the art world, today's craze may be forgotten tomorrow. Not so with whisky. Year after year, *that great V.O. taste* outsmooths and outflavours all the rest. In fact, more people on this planet relax, satisfied, with Seagram's V.O. than with any other Canadian Whisky. Next time, ask for V.O. Relax, satisfied.

Technology and environment

by Marshall McLuhan

photo: TDF

The effects of technological change are discussed by the famed author of *The Mechanical Bride*, *The Gutenberg Galaxy*, and *Understanding Media*. The text is adapted from a lecture given by Dr McLuhan at *Vision 65*, a conference held at Southern Illinois University on the theme "New Challenges for Human Communication."

The really total and saturating environments are invisible. The ones we notice are quite fragmentary and insignificant compared to the ones we don't see. The English language, for example, as it shapes our perceptions and all our habits of thought and feeling, is quite unperceived by the users of the English language. It becomes much more perceptible if we switch suddenly to French. But in the case of environments that are created by new technologies, while they are quite invisible in themselves, they do make visible the old environments. We can always see the Emperor's old clothes, but not his new ones.

If the new environment is invisible, it does serve to make very visible the preceding environment. The obvious and simple illustration of that is the late show. On the late show on television we see old movies. They are very visible; they are very noticeable. Since television, the movie form has been reprocessed. The form of movie that once was environmental and invisible has been reprocessed into an art form, and, indeed, a highly valued art form. Indirectly, the new art films of our time have received an enormous amount of encouragement and impact from the television form.

The television form has remained quite invisible – and will only become visible at the moment that television itself becomes the content of a new medium. The next medium, whatever it is – it may be the extension of consciousness – will include television as its content, not as its environment, and will transform television into an art form; but this process whereby every new technology creates an environment that translates the old or preceding technology into an art form, or into something exceedingly noticeable, affords so many fascinating examples I can only mention a few.

It is plain that the content of Plato's work, of his new written form, was the old oral dialogue. The content of the print technology of the Renaissance was mediaeval writing. What got printed in the main, for two centuries and more after the printing press, was the mediaeval tale, mediaeval Books of Hours, mediaeval liturgies and mediaeval philosophy. Shakespeare lived in the Renaissance world, and the content of Shakespeare's plays, as everybody knows, is mediaeval.

The Middle Ages were the late show for the Renaissance. By the nineteenth century the Renaissance had come into full view. As the industrial environment formed, this progressive time firmly and squarely confronted the Renaissance. The content of the nineteenth-century mind was the Renaissance; the content of the twentieth-century mind is the nineteenth century. We are obsessed with it. It is not as easy to banish that mirage as one might wish.

But one of the most bizarre growths in this development occurred when railways and factories came in. The content of this new industrial, mechanical environment was the old agrarian world, and there was this upsurge of awareness and delight in the old agrarian environment of arts and crafts – the pastoral world. This discovery of the receding age was called the "romantic movement."

The sudden discovery of nature was made possible by the railway and the factories that were so very different from nature. The romantic movement was a product of the mechanical age by way of a contrapuntal environment. It was not a repeat of the mechanical age; rather it was the content of the mechanical age, and the artists and poets turned to processing the old agrarian world into delightful landscapes and delightful pastoral poems. This was in turn altered by the rise of electric technology that went around the old mechanical world of a few decades ago. When the electric technology jacketed the machine world, when circuitry took over from the wheel, and the circuit went around the old factory, the machine became an art form. Abstract art, for example, is very much a result of the electric age going around the mechanical one.

In our time we can see that pop art consists in taking the outer environment and putting it in the art gallery, or indoors somewhere, suggesting that we have reached the stage where we have begun to process the environment itself as an art form. We may be catching up with ourselves. When we begin to deal with our actually existing new environment as an art form, we may be reaching that stage the planet itself seems to have reached. With satellite and electronic antennae as probes, the planet ceases in a way to be the human environment and becomes a satellite itself–a probe into space, creating new space and environments for the planet.

If the planet itself has thus become the content of a new space created by its satellites, and its electronic extensions, if the planet has become the content and not the environment, then we can confidently expect to see the next few decades devoted to turning the planet into an art form. We will caress and shape and pattern every facet, every contour of this planet as if it were a work of art, just as surely as we put a new environment around it. Even as the Romantics began to deal with the old pastoral, agrarian world as an art form when machinery was new, so we will now begin to deal with the planet itself as a work of art.

I think the computer is admirably suited to the artistic programming of such an environment, of taking over the task of programming the environment itself as a work of art, instead of programming the content as a work of art. This situation suggests some considerable changes in the human state. It suggests that the role of art in the past has been not so much the making of environments as making of counter-environments, or anti-environments. Flaubert, a hundred years ago, said: "Style is a way of seeing." Ever since that time the painters and artists have been quite conscious of their jobs as teaching people how to perceive the world they live in. "It is above all that you may see," said Conrad, apropos the meaning of his work.

The training of perception upon the otherwise unheeded environment became the basis of experimentation in what is called modern art and poetry. The artist, instead of expressing himself in various patterns and packages of message, turned his senses and the work of art to the business of probing the environment. The symbolists, for example, broke up the old romantic landscape into fragments that they used as probes to explore the urban and metropolitan environments. Then they turned to probing the inner life of man with

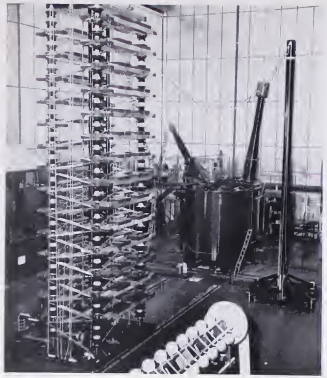


photo: TDF

the same verbal instruments in hand. Instead of using the verbal as a way of expression, they turned it inward for the purpose of exploring and discovering the contours of the inner life.

The psychiatrist took over in the same pattern and began to erode the unconscious. If the unconscious has an important and irreplaceable function in human affairs, we had best look to it – it is being eroded at a furious pace; it is being invaded by dazzling investigations and insights; and we could quickly reach a stage in which we had no unconscious. This would be like dreaming awake. Such may well be the prophetic meaning of *Finnegans Wake* by James Joyce: his idea, among many others, that tribal man lived a dream and modern man is "back again Finnegan" into the cycle of the tribal involvement, but this time awake. This possibility that we are actively engaged in liquidating the unconscious for the first time in history, behooves us to pay some attention to how it is structured, and to what function it serves in human affairs. It may prove to be indispensable to sanity.

One overall consideration for our time is to consider how, in the past, the environment was invisible in its operation upon us. Environments are not just containers, but are processes that change the content totally. New media are new environments. That is why the media are the message. One related consideration is that anti-environments, or counter-environments created by the artist, are indispensable means of becoming aware of the environment in which we live and of the environments we create for ourselves technically. John Cage has a book called *Silence* in which, very early in the book, he explains that silence consists of all of the unintended noises of the environment. All the things that are going on all the time in any environment, but things that were never programmed or intended – that is silence. The unheeded world is silence. That is what James Joyce calls thunder in the *Wake*. In the *Wake* all the consequences of social change – all of the disturbances and metamorphoses resulting from technological change – create a vast environmental roar or thunder that is yet completely inaudible. It is like heat that in organic or other systems creates "noise."

If the environment or process of change gets going at a clip consistent with electronic information movement, it becomes very easy to perceive social patterns for the first time in human history. In the pre-Electric Age patterns were imperceptible because change occurred just slowly enough to be invisible. Was it Bertrand Russell who asked, if we were in a bath whose temperature rose half a degree an hour, how would we know when to scream? The pattern recognition that is quite impossible during processes of slow change, becomes quite easy when the same changes are speeded up even to movie or cinematic levels. So, the artist, as a creator of anti-environments, or counter-environments, created to permit perception of environments, has a very peculiar role in our society.

The artist as a maker of anti-environments becomes the enemy in society. He doesn't seem to be very well adjusted. He does not accept the environment with all its brainwashing functions with any passivity whatever; he just turns upon it and reflects his anti-environmental perceptions upon it. The artist, for the past century, has increasingly fused or merged with the criminal in popular estimation, as he has become anti-environmental. Since Baudelaire, the artist, the sleuth – the Sherlock Holmes type, the James Bond type, the Raymond Chandler-Marlow type – these men have turned a vision onto society that is very anti-environmental, very self-conscious, and the artist has mysteriously been hybridized with the criminal or the anti-social figure. By the same token, crime has become obsessional in our society as a form of artistic expression. This is not lost on children. The delinquent child is often a very bright and keen, perceptive person. It is not lost on him that the kind of overwhelming, brainwashing forces of his environment really call for a little anti-social or artistic and exploratory activity. The child, by delinquent behavior, is aping the exploratory artist. Dostoevsky was aware of this in *Crime and Punishment*. He saw the criminal as a sort of cross between the saint and the artist.

We have, in the Electric Age, come suddenly to the end of the Neolithic Age. After a good many thousands of years of specialized habits and technology and fragmentary toolmaking, we discovered the electric circuits. It is the circuit that has ended the Neolithic Age. The Neolithic Age, just like its ultimate phase, the factory age in the nineteenth century, was dedicated to specialism, fragmentation, and extensions of this or that limb of man. With circuitry we have, instead of extensions of hand, or foot, or back, or arm, a kind of involvement of the whole nervous system, an extension of the nervous system itself, a most profoundly involving operation.

The form and function of the telegraph press can help our observations here. One of the mysterious things about newspapers is that the items in them have no connection except the dateline. The only connecting factor in any newspaper is the dateline, and it is this dateline that enables us to enter the world of the news, as it were, by going through the looking glass. Just as Alice in Wonderland went through the looking glass, when you enter the world of the telegraph or of the circuit, you really become involved in the information process. When you enter through the dateline, when you enter your newspaper, you begin to put together the news – you are producer.

The world of multiscreen projection is the world of the newspaper where umpteen news stories come at you without any connection, and without connected themes. So, what the new film is doing is stripping off the story line in favor of this mosaic pattern of simultaneous projection, which is very much in accordance with electric technology. It is the film world receiving its baptism by electricity. This hybridizing, this crossing of one technology with another, goes on all the time.

I invite you to consider that perhaps the best way of estimating the impact of any new environmental technology is to notice what happens to the older technologies. You can never perceive the impact of any new technology directly, but it can be done in the manner of Perseus looking in the mirror at Medusa. It has to be done indirectly. You have to perceive the consequences of the new environment on the old environment before you know what the new environment is. You cannot tell what it is until you have seen it do things to the old one. The need, however, to understand the processes and changes brought about by new technology gets stronger as the technology does.

We are engaged in Toronto in carrying out a unique experiment – it is far too big for us – we need a lot of help and a lot of collaboration. We are carrying out an experiment to establish what are the sensory thresholds of the entire population of Toronto. That is, we are attempting to measure, quantitatively, the levels at which the entire population prefers to set its visual, auditory, tactual, visceral and other senses as a matter of daily use and preference – how much light, how much heat, how much sound, how much movement – as a threshold level. Anything that alters a sensory threshold alters the outlook and experience of a whole society. The sensory thresholds change without warning or indications to the users thereof, for it is new technological environments that shift these levels. We are concerned with what shifts occur in a sensory threshold when some new form comes in. What happens to our sensory lives with the advent of television, the motor car or radio? If we can establish this sort of knowledge quantitatively, we will have something that the computer can really bite into. A child is a genius till he is five because all his senses are in active

inter-relation. Then his senses shift. The computer will be in a position to carry out orchestrated programming for the sensory life of entire populations. It can be programmed in terms of their total needs, not just in terms of the messages they should be bearing, but in terms of the total experience as picked up and patterned by all the senses at once. For example, if you were to write an ideal sensory program for Indonesia or some area of the world that you wanted to leapfrog across a lot of old technology, this would be possible if you knew in the first place its present sensory thresholds and, second, if you had established what kind of sensory effect a given technology like radio or literacy had upon sensory life as a whole.

On this continent the sensory levels have changed drastically since television. The visual component in our lives has been dropped dramatically and the visceral, the kinetic, the auditory modes of response have shot up to compensate for the drop in the visual component of our culture. This sensory shift has changed the taste in design, in packaging, in every form of entertainment, as well as in every form of vehicle, food and in clothing.

The Beatles stare at us with eloquent messages of changed sensory modes for our whole population, and yet people merely think how whimsical, how bizarre, how grotesque. The Beatles are trying to tell us by the anti-environment they present just how we have changed and in what ways.

To repeat, and to make toward a conclusion, the effect of any new environment – every new technology creates a new environment just as the motor car does, as the railway did, or as radio and airplanes do – any new technology changes the whole human environment, and envelops and includes the old environments. It turns these old environments into "art forms" – old Model Ts become precious art objects, as do old coach lamps, old anything. The world of Camp, for example, is the world of the nursery of thirty years ago being turned into a conscious art form. By simply taking into the shopwindow old toys, old ornaments, and the things Mom used to wear thirty years ago, you turn them into art forms and you have C-A-M-P, this mysterious new archetype.

The new environment is always creating new archetypes, new art forms, out of the old environment. This process can provide invaluable information for those who want to have some autonomy in controlling their destinies and their environments. I think we are rapidly moving toward a time when we might say, with full awareness of causes and effects: "In our present sensory condition, I don't think we could properly accommodate two hundred more lines on television." Colour television will considerably change the whole sensory life of the public. It is a much more tactual form than black and white. But what would happen to the North American world if we did as the French and Germans have done; if instead of 450 lines on our television, we were to put 800? The results might be most gratifying to the educational establishment. If we raised the visual intensity or the visual component of the television image, it might serve enormously to ease the transition from the old mechanical age to the electronic age.

When printing was new, it created what was known as the Public. In the sixteenth century and after, Montaigne's phrase, "*la publique*," came into use. The sixteenth century created the public as a new environment. This completely altered politics and altered all social arrangements in education, in work and in every other area. Electric circuitry did not create the public, it created the mass, meaning an environment of information that involved everybody in everybody. Now, to a man brought up in the environment of the public, the mass audience is a horror – it is a mess. In the same way, the public was a many-headed monster to a feudal aristocrat. He never bothered to study its structure any more than we study the mass.

Circuitry brings people into relation with each other in total involvement which creates the possibility of dialogue and discovery on an enormous scale. The structure of the public had less of such possibility. The public consisted of fragmented separate individuals with separate points of view. The public was an additive structure. The mass audience is a quite different structure, enormously richer – enormously more capable of integrated creative activity than the old public was.

Let me suggest that it may be possible to write programs for changes, not only in consciousness but in unconsciousness in the future. The future of consciousness is already assuming a very different pattern, a very different character. The future of the child is changing beneath our gaze. The small child was an invention of the seventeenth century, according to various historians like Philippe Aries; historically, the child came out of the seventeenth century, did not exist, so to speak, in Shakespeare's day. The child had, up until that time, been so completely merged in the adult world that there was nothing that could be called childhood in our sense at all. And so it is with the family, another seventeenth-century discovery. Suddenly today the child is merging with the total adult environment under electric information processing, and is disappearing from the scene as child.

The future of child may resemble the future of city. The city under conditions of very rapid movement takes on a totally new meaning. The motor car has served to destroy the city as it existed under the railway conditions. The future of city may be very much like a world's fair – a place to show off new technology – not a place of work or residence whatever.

Michael Hayden's maquette for a piece intended for *Sculpture 67* in Toronto's Nathan Phillips Square (Photo: Photo/Story)

The sensory dynamics of new technology

by Arnold Rockman

Mr Rockman, who has organized the Art Gallery of Ontario's Centennial exhibition *This City Now*, discusses the effects of new technology on our senses, and the art forms that reflect them.

Let us suppose it were possible to measure the level of sensory information available in every society for its members. It might be possible to arrive at numerical quantities for sensory input and output which obviously would vary according to which senses are in use and how much sensory training the individual had undergone during early childhood and subsequent development. If all information could be assigned some number so that a bodily contact were worth, say, 5 units per second, a form perceived by the eye 3 units, a word heard by the ear 2 units, and so forth, we surely would find that societies differ in the amount of sensory information that they make available for their members. We would probably also discover that the expressive components of a culture add up to a level of sensory input and output which is maintained. This level is the one to which the society's members have become accustomed.

The introduction of a new technology produces changes in the level of sensory information, which we call cultural change. The changes might be in distribution only: if for instance touch and smell are diminished, then it may be necessary to supply more information through other senses in order to keep the body in sensory equilibrium. This would be to suppose a hypothesis of a fixed quantity of sensory information. On the other hand, it may be possible that the human organism, through society and culture, acquires greater channel capacity over-all. But there is probably a biologically given level of sensory input, regardless of training, beyond which we cannot go without experiencing stress – a form of sensory information overload.

In societies based on small groups and face-to-face relations, in which the individual knows others in many roles, sensory needs are gratified in the most direct way – through face-to-face interaction. Society itself (at barn-raisings, salons, parties, *rites-de-passage* and the like) becomes the major medium for information transfer and sensory gratification. In such societies, communion, communication and community are almost identical. This is the kind of society Martin Buber describes when he interprets ancient Judaism as a dialogue between man and God in accurate analogy with the information transactions occurring in that society between man and man.

There are ways of approximating experimental situations to study the effects of new technology on the sensory dynamics of such a society. For instance, we might study a family as it becomes urbanized, either in our own society or in some other which is now in process of rapid urbanization. We would look for the changes in sensory input and output in that family. In the sense of smell for example, rural families can tolerate much stronger smells than can the urban middle class. Perhaps urbanized people feel the need to acquire perfumes and deodorants (both of the body and the house) in order to restore the sensory stimulus.

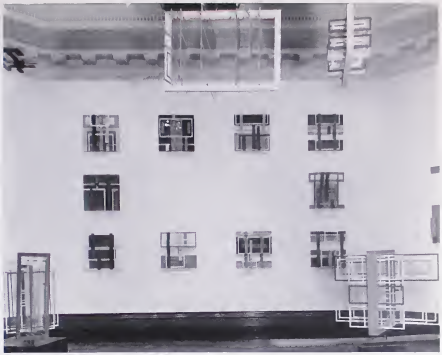
At the same time, when roles become particularized as a direct result of the division of labour when the society is industrialized, face-to-face interaction takes place only between people whose roles express a small part of the sensory information they are capable of taking in and giving out. Sensory channels are not used to anything like capacity; they may eventually dry up, so that we lose the capacity to transmit anything but the crudest of information. This, I think, is what is really meant by "personality inhibition," losing the ability to take part in love relationships. But if sensory channel capacity is some kind of homeostatic, conservational system like other physical systems, then the atrophy of many channels will result in compensation by other mechanisms. We might then agree that the capacity for love can be re-directed or perverted, but that it can never be lost. In these terms of human organism reacting to personal, social and cultural environment, we can understand that the more fragmented and particularized people's lives become, then the more necessary it is that substitute symbolic gratifications be invented. This is the meaning of new cultural forms as an expression of urban civilization, whether these forms be called art, media or technology. One of their main social functions is to keep sensory channels in operation.

So one of the best ways to chart the path of sensory dynamics in a culture is to look at its art forms, using the term "art" in a very broad sense, to include food preparation, plastic surgery, city planning, music, architecture, dance, embalming, painting, horticulture, poetry, advertising, film, radio, television, theatre, industrial and package design – everything that gives form to the spatial and temporal environment within which men have their social being and through which they symbolize social process. If we look at these forms, then we will notice that in some forms in western civilization the sensory dynamics are increasng, while in others they are decreasng. Taken together, they represent that homeostatic equilibrium which "feels right" to the members of the society.

Max Weber points out that the expressive inhibitions of the Reformation were a necessary aspect of the concurrent rise of capitalism. Norman Brown, in his book *Life against Death*, stresses the relation between sensory inhibition on the one hand, and motivation to hard work and capital formation on the other. In these terms, it is not difficult to understand the iconoclasm of the Puritan revolution which banned all painting and other sensory diversions; even in speech, Puritans were enjoined to be tight-lipped. The mediaeval Icon had reduced sensory information so

N. E. Baxter Thing Co. (Iain Baxter)
Bagged Landscape
Inflated vinyl and water, 28" x 24"
This was one of three works which shared the $1500 purchase award given by the Centennial Committee of Vancouver in the Vancouver Art Gallery exhibition *Painting '66*, which Mr Rockman juried.

photo: TDF



Toronto artist Zbigniew Blazeje's *Audio-Kinetic Environment*, seen at the Art Gallery of Ontario, Toronto, last year (January 19 – February 2, 1966) consisted of about twenty-two panels and several moving pieces constructed of wood and plastic. All were coated with fluorescent and phosphorescent paints. Their colours were activated by the continuous play of a lighting system synchronized to taped electronic music patterns. The whole was a realization of the increased sensory dynamics of today which Mr Rockman observes.

that the painting might better function as a spiritual symbol; but the increasingly naturalistic representations of Christ, against which the Puritans reacted, were interpreted as a diversion to the world of appearance away from the world of the spirit.

We know that iconic characteristics have been increasing in western art since the middle of the nineteenth century. The Industrial Revolution "required" a secular iconic art to symbolize thrift: this was architecture. The stimulation that we can receive from the buildings of western society has been declining since around 1850; ornament has been progressively eliminated, texture has been played down, and the emphasis has been instead on structural expression. Architecture, the most important art in terms of socializing people into sensory inhibition, has helped prepare people to play their allotted roles in the new industrial and urbanized social structure.

Photography, the chief means of transferring visual information in our time, is another art of sensory inhibition, as it is mechanical and interposes no extra, personal syntax between sender and receiver. In documentary photography, "artistic license" (visual "noise") is reduced to a minimum. However, what we gain in cognitive reliability we lose in expressive stimulation, even when we add colour – or when we add movement and speech and music in film. In fact, we might argue that a musical or some other aural and contrapuntal track became necessary for film, not only to mask the sound of the projector, but to supply a symbolic structure of feeling that seemed lacking in the mechanical photographic image. What was felt to be lacking was "three-dimensionality" of sensory experience. Perhaps when the three-dimensional holograph movie is developed, based on laser photography, we may find that music becomes a distraction – quite literally noise – since our visual experience of the film will already be using many sensory channels at levels close to capacity.

The increase in sensory stimulation in "talkies" is by no means the only sign of a twentieth-century movement away from sensory inhibition. As the stimulation received from buildings has declined, the city has been supplying ever-increasing sensory stimuli – electrical illumination in the form of automobile headlights, floodlighting, neon signs, and street lighting; higher noise levels in the form of traffic noises, loudspeakers for electioneering, radios and television sets that can be heard through thin, insufficiently insulated walls, jet planes roaring overhead, trains passing by at night, the noise of subway trains, and wall-to-wall music in office buildings; and more visual stimulation from brighter colours and "crude" colour harmonies and contrasts in painting, colour movies, interior decoration and women's fashions. On the other hand (McLuhan's idea that television is a tactual medium notwithstanding), tactual and olfactory stimulation appears to have decreased.

Today, in a post-capitalist, post-Christian era (despite "the restless church"), we are witnessing a dramatic increase in

PHOTO: TDF

sensory stimulation of all kinds. This stimulation is private, and is encouraged by the mass media – largely creatures of the economy working through advertising agencies. I do not take the view that advertising has trivialized human experience; on the contrary, in some sensory channels it has deepened our capacities for discrimination. One has only to listen to children's conversation to discover this. At the same time, our capacities for choice have been widened, perhaps to the point of overload.

We can always shut off the television set, and stop delivery of the newspaper. We can't avoid encountering wall-to-wall music in public buildings, but usually we don't hear it if we have our senses tuned to other frequencies and our minds motivated to other ends. Whether this subliminal hearing might blunt auditory discrimination is an important question. The same question can be raised regarding the rapid increase in visual messages of all kinds – billboards, neon signs, traffic lights, films and television. What seems to be happening is that when you raise the sensory dynamics to new levels, the sensation required has to deliver a bigger thrill. This might explain the rise of dances like twist and go-go, and of course the intense stimulation of the discotheque, the happening, the environment and the trip.

Yet at the same time, publics have been developed for cool jazz performed by groups of chamber-music size, in which the decibel level is equivalent to a chamber orchestra in Mozart's day. And we have the "reductionist" art of primary forms, which seems to increase only the dynamics of colour, a change which may reflect the influence of working under electric light. The relations between new technology and the art forms are evidently complex, and require more empirical research. We need to understand better how our senses work, and how it is that some structures of feeling (art forms in my wider sense) appear to be relevant to our contemporary experience, while others seem at least superficially irrelevant. Meanwhile, it is clear to me that most departments of English and many studies in the history of the fine arts are irrelevant, because they assume without question that the artistic structures designed in another age for upper-class consumption and as symbols of aristocratic feeling are automatically right for our own sensory education in an age in which the sensory dynamics are quite different.

"Masterworks in Canada," the four-page feature which begins opposite, will present important works of art history from Canadian collections. It will alternate with the series "Contemporary Art in Canada," which first appeared in the January issue. In subsequent issues sculpture, graphics, decorative arts and architecture will be included. We think that these reproductions would be ideal for framing and hanging (or just tacking on the wall), were it not for the fold and staples which our magazine format necessitates. If you agree you will be glad to know that as a subscriber you can get a fresh copy of the reproduction (without fold and staple) by sending only 98¢ (plus 25¢ postage and handling per order). In the same mailing tube you will receive the record presenting an interview with the artist or an informed discussion of the work reproduced.

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Severini's Abstract Rhythm of Madame S.

Sponsor: Southam Printing Company Limited (printers to *arts/canada*)

by Joshua C. Taylor

Born in Cortona, Italy in 1883, Gino Severini studied with Giacomo Balla in Rome and came to Paris in 1906, where he was associated with the Italian Futurists after they burst on that city in 1912. Here Professor Taylor, who teaches art history at the University of Chicago and is the author of *Futurism* (New York: Museum of Modern Art and Doubleday, 1961), considers this month's colour feature, a painting by Severini, and the related works reproduced on the page following it.

"Among these (portraits from 1912)," Severini recalled in his autobiography of 1946, "the portrait of Mme M.S. is important, showing my essentially plastic preoccupations. Was I in line with the cubists or with the futurists? I confess that I was not at all concerned with the matter."

Although Severini's preoccupations may have been essentially plastic, the winsome Mme M.S. in her great plumed hat peeps out through her curls with a disregard equal to Severini's for "schools" or "isms." She is chic and feminine, and no amount of reasoning can argue away her coquettish vitality. Her features are as elusive as a remembered glance and quite as indelible. She is, in short, a significant personality whom everyone remembers having at some time known. Severini's *Self-Portrait*, drawn in the spring of 1912, provides a more complex problem. In the first place, it would be impossible to describe the pattern of lines without discussing the features; yet any one feature cannot be examined without our attention being drawn quickly into a rhythmic pattern of lines. The process of looking and Severini's likeness are entangled to such an extent that our notion of the sitter is clearly a product of the way we see, and the head would seem to have no objective existence beyond the act of our perception. This can have an alarming effect on our sense of stability. There is nothing static to hold on to; there is only a continuously shifting image that defies any effort to reduce it to a static whole. The prudent solution is to go along with it, gathering insight along the way.

And insight is to be had: this is no simple play of forms. Somehow out of this complexity there emerges a strong realization of specific character. Not only that, but the drawing radiates an undeniable state of mind. In spite of the distraction of shifting planes, in creating his likeness Severini seems to look deeply into his mind rather than to be content with the forms of his face, and the spectator does likewise. Why should this be? Possibly because the very forms that break up the totality of the object force us to linger on various features which, in their original identity, forcibly come to mind at crucial moments in the rhythmic pattern we pursue. For example, the elongated curves which surround the area of the mouth are persuasive as movement in their own right, yet keep promising to coalesce into a mouth and chin; yet they never quite produce the ultimate form. So the mouth with the firmly gripped cigarette remains in the process of expression, identifiable more through our action than through simple verisimilitude. And the eyes, too, seem to be buried in a process of looking rather than remaining fixed orbs to be looked at. The distance that separates our consciousness from the likeness of Severini has artfully been destroyed, and the tentativeness with which we grope for the image becomes a part of the living quality of the man we see. It was not long after making this drawing that Severini created his likeness of Mme M.S., probably in the summer of 1912. In one way it is markedly different from the drawing: the shifting planes seem less closely derived from the forms of the figure. The rhythms are bold and swinging, and the planes transparently cross one another in space. Every inch of the canvas is embraced by the consistent action that choppily swings from side to side like the motion of an eccentric dancer. There is no obvious source of this action other than the inter-related shapes themselves. In fact, the identifying details of the likeness are much less apparent than in the self-portrait drawing, seeming almost by chance to grow out of the jaunty motion. As a result there is a greater element of surprise in our discovery, and with surprise, a piquant humour. In the lower right corner a group of shapes that threaten to be simply geometric turn into a self-possessed pug-nosed dog whose beady eyes defy us to return him to geometry, no matter how much our bent for theory would like to.

The effect provoked by this greater separation of the identifiable element from its original context and its association with a more expansive order can be judged from a comparison with a pastel study that Severini made for this painting. In many ways it is identical in its forms with the painting in oil, but there are some significant differences. As in Severini's self-portrait, there are many small forms struggling to gain attention and many details of curls and lace to catch our interest. The large curved forms that roll through the painting are only suggested in the drawing, which depends more on broken angular lines. Less easily swept away from the integrating forms of the head, we thus concentrate more on the face and its features, moving more slowly from part to part. The structure of the nose and lower face holds our attention as we follow down to the mouth and chin. And here a major difference strikes the consciousness. In the painting, the smooth curve of the cheek moves easily to join the large curves that sweep through the whole composition, forgetting to refer to the mouth at all. It is only on swinging back to the left that we encounter the rounded chin, and the mouth smiles up expectantly from under a curved plane that shades it like the brim of a hat. The encounter is doubly a surprise because the placidly waiting mouth could hardly be anticipated from the soulful eyes. Suddenly the painting shifts gears: the urbane chin becomes a part of the saucy angular pattern that culminates in the carelessly-held cigarette with its elegant crest. The coquettish Mme M.S. has become a more complex, albeit more public, personality. She fits perfectly into that gala canvas, *The Dynamic Hieroglyph of the Bal Tabarin*, which Severini painted while in Pienza, Italy, in the summer of 1912.

The concentration on an intimate view of the face and a glimpse into a flustered state of mind may have been lost to a degree, but in compensation our lady is encountered in a freely lyrical disposition. The tight presentation of personality has been loosened to expand into a rhythmic dance; the analysis of another individual is of less concern than the sharing of a pleasurable activity. This is not to say that Mme M.S. has lost her individuality! We should recognize her anywhere. But the meeting is always haunted by the tune that marks her special world. If musical rhythms are evolved from a work, so much the better, said Severini in the preface to his London exhibition of April 1913, as "this establishes the complexity of our art." It also establishes a new category of artistic experience.

So convinced was Severini that this totally engrossing rhythm was more significant than a concern for individually perceived objects that on his return to Paris in the autumn of 1912 he began to work wholly in rhythmic forms that might or might not make specific reference to the shapes of things. He used relief and glued on shiny sequins to destroy the static flatness of his canvas. Likeness was just a glimpse in passing, as in his water colour of Mme Severini in a colossal hat. When he showed the portrait of Mme M.S. in Rome and Florence later the next year he called it *The Abstract Rhythm of Mme M.S.*

What did this "abstract rhythm" actually mean to Severini? Why was he so insistent on forcing one to glimpse his images in a context of motion? For him, as for his Italian Futurist associates, poetry was by definition the continuous engagement in a creative act. The dance is a perfect analogy for this poeticizing act. You cannot see a dance, you can only follow it. It exists only in the act or as it is reconstructed in the imagination. Such was the image that Severini sought in his portrait of Mme M.S.: not a record of what once she looked like, but a pattern of dance that would allow us to rediscover her in a continuous flow of life, our life as well as hers.

Gino Severini (1883-1966)
Abstract Rhythm of Madame S.
Oil on canvas with sequin, 36¼" x 25½". 1912
Ayala and Sam Zacks Collection, Toronto
(Photo: TDF, Toronto)

Sponsor: Southam Printing Company Limited (printers to *arts/canada*)

Other Works by Severini

1

2

3

4

1 *Study for Madame M.S.*
Pastel, 19¼" x 13⅞" 1912
Coll: Lydia Winston Malbin, Birmingham, Michigan

2 *Self-Portrait*
Pencil. 1912
Art Institute of Chicago

3 *Portrait of Madame Severini*
Water colour, 28¾" x 21¼" 1913
Coll: Lydia Winston Malbin, Birmingham, Michigan

4 *Dynamic Hieroglyph of the Bal Tabarin*
Oil, with sequins, 63⅝" x 61½" 1912
Museum of Modern Art, New York

Velvet Underground in Hamilton

by Barry Lord

***Arts/canada* attends McMaster University's multi-screen audio-visual psychedelic evening.**

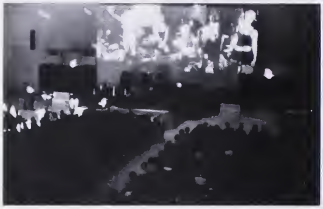
Back in 1960 Andy Warhol was painting works like *Dick Tracy*, using casein on canvas to represent the comic strip character with pertinent smudges, smears and drips. By 1962 he was painting in liquitex, and had replaced the brush strokes and drips with the subtle distortions of an unevenly screened reproduction process. He had also collaborated with Campbell's packaging department to produce his famous soup cans, and with Raymond Loewy Associates to paint Coca-Cola bottles. His interest in the repetition of an image screened at different values of detail and intensity led naturally to the newspaper photograph, and thereby to the motion picture: the successive frames of a film are a vertical correlate of the still photo reproduced with varying screens, and a Warhol film like the one of the Empire State building with its lights going on and off over a period of many hours is a logical extension of works like the Jackie Kennedy series, where the uneven screen sets up a comparable play of light values on an immediately recognizable image.

These characteristics – significant distortion of the image, interest in the visual and psychological results of its repetition, collaboration with others, the maintenance of a single environmental effect through experienced time, and a concern with mechanically produced light effects – are evident in Warhol's latest work, *The Exploding Plastic Inevitable*. The *Inevitable* is neither painting, nor sculpture, nor cinema; it cannot be called a happening, since it recurs at regular intervals on schedule (nightly in New York). Nor is it an environment limited to one place, as McMaster University in Hamilton proved by inviting it up to open an arts festival in November.

Andy Warhol's *Exploding Plastic Inevitable*

all photos: Ian MacEacheri Toronto

At centre screen, faces of the members of The Velvet Underground are superimposed over the film. Here, Nico materializes, sometimes in colour.



The evening began in McMaster's new gymnasium, before a quiet seated audience; though the *Inevitable* prefers the response of dancers, McMaster decided to sit everyone down, pleading a new plastic floor.

After about thirty minutes of sight and sound, during which spotlights and slide projectors add to the spectacle, The Velvet Underground musicians, one by one, quietly take the stage, and begin to improvise to the recorded sound of their own music. Thus Warhol continues in the pop art tradition of concern with levels of representation, the reproduction and the original. Nico, whose face is on the screen, suddenly appears in a spotlight.

On a wide screen behind the stage, *Vinyl*, a film by Gerard Malanga, Warhol's foreman in his New York art factory, was projected from two machines: to the right, the first part of the film, in which Malanga dances, exercises, sits watching a man and girl, and finally becomes aggressive; to the left, shown in the same time period, the second part, in which Malanga is beaten, stripped to the waist, and bound to a chair with his head encased in a black vinyl hood covered with metal studs. The same persons remain or re-appear in both halves, so that we are watching two images similar in general character, but significantly different in specific detail – a cinematic equivalent to the repeated faces of *Marilyn* and *Liz* in Warhol's silk-screened paintings of several years ago. Two loudspeakers provided sound, the film dialogue purposely distorted on one track, and on the other the recorded sound of The Velvet Underground, the group which Warhol chose to play with the *Inevitable*.

Nico, with striking features and a driving voice with a rich chromatic range, is the singer with The Velvet Underground. Some of the lyrics, which must be heard while the speakers, the slides, the films and the spotlights continue, are about psychedelic experiences; most are not as explicit.

The Velvet Underground's electronic instruments include amplified guitars, violin, cello, piano and drums. The sound is harmonic, insistent, pulsing and sustained – suggesting comparisons with Indian ragas, and usually called simply psychedelic.

Gerard Malanga, Warhol's art foreman and film-maker, is also the group's dancer. Before a constantly flickering battery of strobe lights, Malanga uses a variety of props – a Marlon Brando shirt, a variety of

sashes and ropes, and spoon and gear for a "fix" in the set piece *Heroin*. Sometimes he used the strobes directly, sometimes a candle – suggesting again the Warhol interest in light values. The final half-hour song created an environment in time as well as place, so that it began to seem to at least some of the McMaster audience as if life had always been this way. To others, it had been a confusing, noisy, probably frightening experience, and when the lights went up it was found that a good number had left. The ones who stayed had been a little more than an audience: like the newspaper photographs and Brillo boxes that Andy formerly used, they had become part of a Warhol art work.

Les Levine's *Slipcover*

A theatrical environment in Toronto

by Paul Russell

A young Toronto artist, now living in New York, returns to the Art Gallery of Ontario to use the new technology in many ways.

Post-war American abstract expressionist painting projected a mood of extreme introspection, a mood which has continued to this day, ever more extreme, among the New York abstractionist avant garde. It freed painters to follow their own ends and provided the necessary climate for today's painting–the purist concern of artists such as Noland and Olitski. But to many, painting was still too bound to the everyday world, too much a social tradition with historical values and implicit relationships to society in general. So, painting must go, the frame and sculpture pedestal must go. Freedom of the personal gesture in painting proved to be merely an enticement. Introspection continued and demanded satisfaction in ever-varying and more total forms. To achieve this totality, the artist has now curiously turned back to the most current aspects of today's world for ideas and materials, to the fields of industry and modern technology. Pop art, op art, happenings, industrial sculpture, environments and architecture as sculpture (the new Toronto City Hall for example) are all part of this trend, this attempt to "turn on" the whole artist's conscious and subconscious in a manner that demands total involvement from the spectator (who has in fact become a participant). The current fashion for LSD is another aspect of the same drive to make the subjective somehow more real

Plug Assist
Vacuum-formed Uvex plastic, 35' x 9' x 3'
Fischbach Gallery, New York, 1966

For this decade, the total sensual experience, perceived through time, is the one with impact. Aside from architecture, traditionally the most environmental art, but also the one most limited by utilitarian considerations, film has in this century been the art medium most closely approaching total experience in time. It has also been the most meaningful and universal art form of its time, as crass as the end product has often been. To go beyond the film (attempted by the industry itself with experiments in three-dimensional film, ever wider screens and olfactory stimulants) is to *actually* pass through the sensual experience in time, which leads us of course to the happening and the environment.

The prime mover of the new technology in Toronto over the last few years, certainly the Canadian artist most in tune with environmental ideas, has been Les Levine. An environmental format and synthetic materials have been intrinsic to Levine's viewpoint since his Toronto showings in 1964, the Pink show at Hart House and the Silver show at the David Mirvish Gallery. Both were exhibitions of individual saleable objects, but their total effect as shows, as environments, proved to be their most exciting aspect. Levine's biggest and strongest statement of environment so far, uncomplicated by any other consideration (such as breaking it down into individual saleable units) was his exhibition at the Art Gallery of Ontario last fall, *Slipcover*.

Slipcover was exciting for Toronto. It was environment very much akin to a fall fair magic carpet ride (done very well) or a "trip" on LSD. It was psychological, Freudian, cryptic, sexual, and ever variable. For all who see and hear and touch and enjoy all these experiences for themselves, it was wildly amusing. As Levine put it, "a slipcover is a very common object which is used by most people to change their world."

Levine considerably changed the world of the Art Gallery of Ontario, with mylar silver-toned surfacing, butyrate two-way mirror panels, delayed playback voice recordings, compressed air contortions, and continuously moving light patterns. The visitor prepared himself for the ritual of *Slipcover* by removing his shoes at the entrance. He then passed through the vinyl silver curtains into an all-silver, shimmering world of continuously changing tunnel-like spaces formed by expanding and expiring air-compressed shapes which grew out from the centre of the octagonal room. Added to the immediate visual impact was the disquieting effect of hearing your initial comments spoken at the entrance, played back in the gallery accompanied by an almost hypnotic background of purring motors and the hiss of escaping compressed air. Constantly changing light sources reflected vari-coloured patterns across the walls, the ceiling and the moving central shapes, all of which lost their individual identity and became one environment.

A drug-induced "trip" is a similar sensory (but not physically real) experience. The person "stimulated" perceives an environment of psychic shapes, colours and sounds. He has a take-off point in the everyday world, but the freed impulses of his personality sweep him beyond it.

In *Slipcover* Levine used the materials of current industry to impose a psychic environment on his gallery. The gallery in its original form was his departure point, and as one wandered through his creation, images occurred which recalled the original condition of the room. The usual layout and contents of the gallery were dimly persistent in the silhouetted images of paintings and sculpture formerly exhibited there, which flashed or distorted across luminous metallic surfaces as ghosts of

Silver-sprayed canvas on wood
Isaacs Gallery, Toronto, 1964

Levine in *Slipcover* at the Art Gallery of Ontario, Toronto, 1966 (Photo: Ron Vickers, Toronto)

the past. Overlying this basis of vague recollection were the purely sensory factors, the constantly changing spaces of the place, the quietly moving reflected light patterns and the click, purr and hum of various background mechanisms. All surfaces were smooth and silvery and slippery, producing a total tactile sensation on every side – below the feet, at the tips of the fingers and on the side as one brushed against altering compressed air forms.

Slipcover was not an eccentric plaything in Levine's development as an artist. It was an essential stage in that development. His vision has remained constant since his first shows in Toronto three years ago. The sensuality of the shiny synthetic surface and the ghost-like quality of familiar objects camouflaged have been the basic Levine imagery for some time. It is in the adaptation of ever more sophisticated materials to achieve the very spirit of the thing or the place that Levine has made his great advances. Early pieces were merely painted canvas stretched over skeletons of dismembered tables and chairs. Then he went on to experiments in paint and plastic coats for the canvas which would bring about more sensual, more consumer-product surfaces. Mylar and butyrate carried this Levine technology a further stage in *Slipcover*. The camouflage was true to form – gleaming and rich, but also pliable enough to provide the constantly changing spaces essential for an experience in time. Mylar and butyrate are very sensuous and tactile, and highly reflective, creating marvelous light patterns. Levine's adaptation of the proper materials went still further in this work; he incorporated the visitors to the show into his art form. As the artist predicted, "the most interesting part is that people will be the work of art, because everything is going to come off those walls onto people. People will have parts of paintings on their faces, and you're going to have people who have a Picasso right across their shirt, because everything will reflect off the walls, and the only thing that will really give a very definite clear image is something that is white or very light. People who are wearing white shirts or something like that will be lit up as if they are moving visions. It will be as if they're translucent. The room will have a fluidity. People will seem to be melting in the room because of what is being projected off the walls. When the image is reflected off a mirror and hits the other side of the room, it gets very much bigger. So there will be the feeling, 'Did I see it over there, or didn't I?' There will be the strange feeling, all the time, of, 'What did I see? What am I seeing?'"

Levine sees his purpose as an artist in making a personal statement about the human environment. In *Slipcover* he imposed a Levine environment on the art gallery, a synthetic environment of modern materials of which the aesthetic and sensual qualities are found to be as valid and enjoyable as those of nature. North American advertising of consumer products has been based on this premise for some time. Artists like Les Levine see this commercial aesthetic as the vital one of this age, a theory difficult to convey to a national mentality such as Canada's where aesthetic matters are lumped together under the term "culture" in the Victorian manner, and maintained self-consciously as distinct from all the tarnished values of the contemporary environment.

The electronic computer: a new tool for the artist

by Leslie Mezei

Professor Mezei, of the University of Toronto's Department of Computer Science, forecasts the uses of a new technique.

The great "man versus machine" debate is taking a new turn. The real question is: "How can we best make use of the machine for our purposes? Which tasks is man better at, which the machine? How do we best combine the two to obtain a true man-machine "symbiosis," a co-operative effort?"

The computer can process any type of information, be it numbers, alphabetic text or visual, graphic material; however it cannot do everything to this information that the human can, and we cannot endow it with creative power, intuition, feelings and value judgements.

The computer is a rapid and accurate symbol manipulator, which can be instructed to perform any task for which we can find clear, complete, well-structured rules. Man, on the other hand, cannot manipulate symbols as rapidly, he can only deal with a small number of them at a time, and he forgets rapidly. However, he can make up the rules of the game as he goes on; he can make creative intuitive jumps of the imagination; he can form value judgements even when he cannot define these values explicitly.

Man and machine complement each other. Let us find a way to combine their strong points, a way for them to work together. The computer can respond to our wishes continuously, store away large quantities of facts, figures and procedures, perform complex manipulations in split seconds and display the result for evaluation by the human mind.

In an earlier article (*Canadian Art*, November/December 1964, No. 94, p. 365), Arnold Rockman and I explored the possibilities of "The Electronic Computer as an Artist." That approach consists of a search for the rules which will give us good art. It is easy to program a computer to produce golden rectangles, Fibonacci series, as well as the regular mathematical figures of op art. It is just as easy to make the result more interesting by combining these with representational symbols, such as fish and doves, by rearranging them using various manipulations such as rotation and change in size, and also by distorting them in various ways, including the use of random numbers.

The first exhibition of computer art of this type in New York actually opened at the Howard Wise Gallery on 6 April 1965. The invitation was sent out on punched cards:

COMPUTER GENERATED PICTURES
EXECUTED BY DIGITAL COMPUTER
CONCEIVED BY
BELA JULESZ AND MICHAEL NOLL

Although this was a "first," the show did not attract too much attention. I have come to think, however, that this is not the right approach. We should continue our search for the rules of art, be they mathematical or otherwise, for a definition of the elements of visual expression, for a grammar of design outlining the possible relationships of these elements, and for criteria to evaluate works of art, since this would provide us with greater insight into the whole area of the visual arts. Meanwhile I do not think that artistic design by computers alone will progress very far.

Computer art exhibitions
In January 1965, George Nees showed his computer art in Stuttgart; and later that year exhibited again in that city, with Frieder Nake, whose *Pattern with Squares* was awarded first prize in the 1966 annual competition sponsored by *Computers and Automation* magazine. The Institute of Contemporary Arts in England is now assembling an extensive international show, *Cybernetic Serendipity*, which will open in January, 1968. In the United States, in addition to the Howard Wise Gallery 1965 show in New York, there have been exhibitions at the Forsythe Gallery in Ann Arbor, and at the 1965 computer conference in Las Vegas.

This should not blind us to the possibilities the computer has, in the hands of a competent artist, who would use it as a new tool. To make the distinction clear let us analyze the two processes. In the first case what we were doing was in effect giving a commission to the computer: "Create a portrait of the Prime Minister, using only line drawings, and composed of abstract shapes, etc." The computer, given the basic rules as to what is a line drawing, what shapes are allowed and so on, proceeds from a photograph, giving us, without human intervention, the final product. Whether the result comes close to what we hoped for or not, whether we like it or not, there is nothing we can do about it at this stage.

In the more useful application of modern technology, which I am about to suggest, let us imagine our artist sitting at the display tube of a computer, much like a television screen. He has a light-pen in his hand, with which he can draw on the tube. The computer has been pre-programmed to carry out specific tasks which are performed when he presses specific buttons, or flips switches, on the console of the display tube. These tasks include "enlarge" and "compress," "rotate," "move left, right, up or down," and each can be applied to the whole picture on the tube,

or to specific parts of it. The whole image, as well as sections of it, can be stored away in the storage memory of the computer and recalled at any time.

As before, we start with a photograph of the Prime Minister, which is scanned by an optical reader, stored in the computer as coded electronic impulses, and displayed on the tube. The artist may decide at this point to draw the outlines with his light-pen to obtain a line drawing and have the computer store this, while erasing the original picture. Erase from the screen, yes, but it is still stored in the computer. If he wants to compare the picture he has made at some later stage with the original photograph, he can recall it with the flick of a switch. A new meaning of "erase," isn't it? And how powerful!

He now looks at the line drawing and may decide to make geometric shapes out of it. He points to all of the curves which are nearly circular, and by pressing a button, instructs the computer to change them to perfect circles. He could do the same with triangles, straight lines and other figures. He now leaves on the tube one small detail by itself, enlarges it to fill the screen, changes it in any complex way he wishes – which he could not have done on the original, smaller scale – then reduces it in size before he replaces it in the rest of the picture. He can, of course, move it along to any part of the picture with his light-pen, he can rotate it, change its size, and reproduce it as many times as he likes without having to redraw it. The picture is evolving in front of his eyes. He can backtrack if he doesn't like the latest steps he took, he can retrieve parts he threw out earlier, he can compare various stages. The need for preliminary sketches and studies vanishes! This system can be very powerful in the hands of a skilled creative artist. And how valuable the intermediate stages, recorded on film, can be to study the artistic process, as well as in the education of the art student.

The type of equipment required is already being used to design houses, cars, and computers. In three-dimensional design we just draw two of the sides and the computer provides the third side, as well as a perspective view of the whole. By turning a knob, we can rotate and tilt the picture continuously so that we can observe it from all sides.

There are over twelve hundred computers in Canada now, and there may be over three thousand by 1970. Most of these can be connected with the input-output devices required. Cathode ray display tubes are becoming commonplace, along with light-pens. Digital plotters, which record graphic data from computer output on paper, as well as microfilm recorders which put them directly on film are manufactured by a number of companies. There is no reason why digitally controlled milling machines, run by computer generated punched paper tape could not be connected as well, so that sculpture can be assisted by these techniques also. These machines are widely used to make machine tools, ships' hulls and other three-dimensional objects. Input equipment which is already available includes optical scanners to "read" from paper, film readers as well as curve followers which can trace a curve and translate it into electronic symbols for computer storage and later retrieval. The latest computer systems can accommodate thirty and more users at once, who don't have to be near the computer, but can communicate with it through telephone or teletype lines. The cost is much reduced, since each user only needs the central computer itself for a few millionths of a second at a time. They have mass memory devices attached to them, which can store millions of items of information. We could keep all of our data there permanently, renting it like a safety deposit box.

The most difficult job is the development of the instructions to the computer, the program, which has to be built up painstakingly in the smallest detail. The program to "enlarge," for example, might examine the area to be enlarged, as well as the area into which it is to be expanded, calculate an "enlargement factor" and apply this step by step to each and every line or point in the picture. Once we have a generalized "enlarge" routine stored in the computer it can be used as many times as desired. The artist at the display console merely pushes the button, or maybe writes the word "enlarge" on the tube. Some day all he will have to do is to say the word "enlarge" and it will be done.

Some artists want to create their art with their own hands, with nothing more than a pencil or a brush between them and their artistic product. There are other artists, on the other hand, who want to use new tools and techniques. Certainly the creators of kinetic art belong to this category. My only quarrel with them is that they still work in the electric age, when the far more flexible tools of the electronic age are available to them. To the creators of op art, I am offering a reduction in the drudgery of drawing circles, squares and so on in endless combinations. They need only specify the effect they want, and the computer can do the rest. It can also offer the techniques of randomization and distortion, which would make the result more varied.

The artist sitting in front of the display tube, once he has mastered the manipulations available to him as he must master the pencil and brush in art school, can be free to allow his unconscious mind to work. He will be able to select his subjects freely, organize them according to his own subconscious patterns, judge the result and change it according to that judgement. He must have the creativity and the ideas; the powerful tool I am proposing will merely reduce some of the labour of execution.

Such an art machine could be started on a modest scale with further components added later. Colour is now a possibility. A more remote dream is the display of the result as a "hologram" by use of laser beams, giving the illusion of really solid three-dimensional objects. The truly universal artistic machine could combine all of the arts. Music, dance, poetry, film, etc. could be added, to produce the dream of Joseph Schillinger: kinetic art utilizing all of our senses.

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